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1. Title of the Invention:

Air sterilization and purification apparatus

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5. List of Appended Documents

(1) Specification (2) Drawings

1 set 1 set

(3) Duplicate Copy of Application

1 set

(4) Power of Attorney

1 set Method Examination

(5) Request for Examination

1 set

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#### Specification

1. Name of the Invention: Air Sterilization and Purification Apparatus

#### 2. Scope of Patent Claims

In an air purification apparatus that passes positively charged airborne dust between opposing electrodes, an air sterilization and purification apparatus wherein air is caused to pass through while inducing a separation phenomenon by switching the direction of flow of air that passes through the aforementioned opposing electrodes and modifying a cross section of the passage.

#### 3. Detailed Description of the Invention

The invention of the present application is one that relates to an air sterilization and purification apparatus, and in a purification device that causes airborne dust particles to be absorbed by static electricity, relates to a device capable of raising dust removal effectiveness, and is intended to achieve an air sterilization and purification apparatus that, in particular, is made up of a combination of novel and ever simpler elements, is manufactured by a simple process with lower costs of production, and that, with excellent safety, is capable of achieving even better results in use.

Along with the development of heavy industry, air pollution from sources at each stage of the production process, nitrous oxide and sulfur dioxide emitted from transportation sources, and heavy metal particulates, have steadily increased. The widespread expansion of pollution has become an issue of serious concern to society, and various regulations have been proposed to prevent pollution, including preventing the generation of toxic materials as well as the strengthening of emissions standards. These approaches, however, cannot be considered adequate, and there are a growing number of people who suffer from lung cancer and other cancers as well as an increase in the number of people suffering from asthma. Air purifiers have become a common and indispensable part of life and are to be found installed in homes and sickrooms to prevent and/or treat these illnesses, and are used as prevention or treatment devices in the production stages of sanitary pharmaceuticals, foods, devices, and are also employed in the production of precision machinery.

A variety of devices have been suggested to cleanse the air by removing airborne toxic materials. Among those are air purifiers that use filter materials in air flow passageways to physically collect the dust, or electrical air purification devices such as dust removers that make use of static electricity or infrared rays to disinfect the air, or a combination of any of these approaches in order to remove toxic materials.

Among these, suggestions for conventional devices based on the aforementioned use of static electricity are known, including, for example, (a) an approach utilizing centrifugal force designed such that air, induced from an air inlet, passes through an ionization element while electrical voltage is applied to the inner and outer cylinders while the inner cylinder rotates, moving the air between the inner and outer cylinders, and (b) an approach where, in the above configuration, the outer circumference of an inner cylinder has inclined guide vanes provided in the axial direction along the outer circumference of the inner cylinder and rotational movement is applied to the air as it passes through between the inner and outer cylinders to make use of centrifugal force.

The above mentioned approaches have attempted combined dust collection by the use of electrostatic migration and centrifugal force, however, because high voltages with 11 KV in between the inner and outer cylinders, and as a result of rotating the induced air, a rectified electricity may be generated due to frictional resistance depending upon the air flow rate, and electric discharge sparks may occur between the dust particles that have collected onto the external cylinder, frequently causing risk of electrocution as well as the increased production of ozone and possible malfunction of the device.

In view of the above, research conducted by the inventors of the present application have overcome and eliminated the well known defects described above, and have perfected a device that is superior in terms of safety and that markedly increases the efficiency with which dust is adsorbed. The invention comprises a fan motor; an inner cylindrical electrode that has a

built-in high-voltage transformer, and that is connected to the positive side; a high voltage cap connected to the negative side; an external cylindrical electrode that is earthed; and a housing that has openings on both sides, and that is supported by a pedestal. On occasion that airborne dust that is guided into the unit through the upper inlet passes through an ionization section high-voltage cap that is connected on the negative side, a positive charge is applied to the dust, and it is guided into the electrostatic field between the grounded outer cylindrical electrode and the positive inner cylindrical electrode, and as a result of the electrostatic induction effect, airborne dust passing through is adsorbed onto the surface of the outer cylindrical electrode. Thus, the present invention is characterized by having opposing electrodes that have a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed curved surfaces on the inner cylinder and an outer cylinder provided with a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed surfaces, wherein the convex curved surfaces or recessed surfaces of the inner cylinder and the convex surfaces or recessed surfaces of the outer cylinder alternate with each other. By creating an electrostatic field between these opposing cylinders, the direction of the flow of air passing through them can be alternated, and the flow passageway cross section can be altered so that the flow rate fluctuates, thereby creating a flow separation phenomenon. This causes the generation of a stagnant flow, a reverse flow, or a turbulent flow of air that contains dust. The intention here is to extend the duration of the effect of the electrostatic adsorption on the outer cylindrical electrode surface and to increase in the efficiency of dust removal. The next object of this invention is to provide a device with superior safety. Additionally, an object of the invention is to provide a simple and compact mechanism that can be made available at low cost and that can be placed easily in a variety of locations, as well as to provide a device that allows simple, easy, and safe cleaning of the panel upon which the dust has been adsorbed. Other objects and characteristics of the present invention can be understood. from the following explanation.

In Figs. 1 through 5, a housing acceptor cylinder (5) is supported on a stand (1) by means of a shaft (2) upon which a support board (4) consisting of insulating material and provided with exhaust windows (3); an external cylinder accepting cylinder (7) is mounted on the edge of the lower opening section of said housing; an exhaust windows (6') is arranged in the external cylinder barrel (7); and a fan motor (8) is internally installed in a motor cap (9). The fan motor (8) (for practical purposes, preferably with a maximum torque of  $1040 \pm 10\%$ ) is connected to a power source, and the motor cap (9) has a built-in high-voltage transformer (11) that is connected to a power source. An inner tube electrode (14) made of metal and provided with stepwise alternating vertical curved surfaces (12) and convex curved surfaces (13) is installed onto the positive side of the high-voltage transformer, and a rounded-head inner cap (16) made of insulating material and continuing the multiple outer cylinder support [illegible] (15), (15) is mounted in the top opening of this inner cylindrical electrode (14). A metallic high voltage cap (18) that is provided with a limit switch (17) is installed in this cap (16) and connected to the negative side of the high-voltage transformer and a metallic outer cylindrical electrode (22) provided with stepwise alternating vertical curved surfaces (20) and recessed curved surfaces (21) on the upper opening edge step section (19) of the outer cylinder acceptor (7). The vertical arced surfaces (20) and the recessed arced surfaces (21) are positioned so as to face the swelling arced surfaces (12) on the inner cylindrical electrode (14) and the vertical arced surfaces (12) on the inner cylindrical electrode (14) with each other, respectively. The external cylindrical electrode (22) faces the inner cylindrical electrode (14). According to FIG. 1, an air inlet window (23) is arranged in the upper opening of the external cylindrical electrode (22), and a retainer plate (25) made of insulating material is provided on the bottom limit switch retainer element (24). Next,

the housing (27) is installed on the upper opening of the outer perimeter section (26) of the housing acceptor cylinder (5), which is installed on the support board (4). A head section retaining cylinder (28) is installed at the top section of this opening, and an air inlet window (29) is provided in this upper opening and a connector board (31) made of insulating material and provided with dust-proof mesh/screen (30) that is connected by means of bolts (32) to the retainer plate (25), air inlet windows (29), and air inlet windows (23), and is configured so that air passes between the inner and outer electrodes, the exhaust windows (6), and the exhaust windows (3), and is circulated to the outside when the fan motor (8) is operating.

At this time, when the high voltage transformer (11) and power source are connected by a switch, which is separately arranged (in practical terms, an input voltage of 100 V AC and output voltage of 7 KV DC are preferable) the airborne dust that is introduced [into the unit] is positively charged in the vicinity of the transformer (11), by the inner cylindrical electrode (14) that has been connected to the positive side by means of the electrostatic induction between the inner and outer electrodes, and is migrated to the external cylindrical electrodes (22) and clung to its walls.

Here, the direction of the air flow that is passing through the convex curved surfaces (12) and vertical curved surfaces (13) provided on the inner cylindrical electrode (14) is switched by the vertical curved surfaces (20) and recessed curved surfaces (21) provided on the outer cylindrical electrodes (22), and as a result of the change in the cross section layer between these electrodes, the spacing between the vertical curved surfaces (12), (20) of both electrodes should be approximately 20 mm; the spacing between the vertical curved surfaces (21) on the outer cylindrical electrodes (22) and the convex surfaces (13) on the inner cylindrical electrodes (14) should be approximately 16 mm; and the spacing between the recessed curved surfaces (21) on the outer cylindrical electrodes (22) and the vertical curved surfaces (12) on the inner cylindrical electrode (14) should be approximately 25 mm, for practical purposes. The recessed curved surfaces (21) should be 5 mm in diameter, while the convex curved surfaces (13) should be 4 mm in diameter. There is a change in flow rate, and the separation phenomenon is augmented. As a result, the dust-bearing air flow stagnates, reverses or becomes turbulent, thereby extending the duration for electrostatic adsorption and increasing dust collection efficiency (Fig. 6).

In the cross sectional configuration of the above mentioned both electrodes described above, in another embodiment, the convex curved surfaces (13) of the inner cylindrical electrodes (14) could have a gentle linear flow [illegible] convex curved surfaces (13) on the upstream side to intensify the switching of the direction of flow and the change in the flow passageway cross section, making it that much easier for the separation phenomenon to occur, forming lead (33) between the convex curved surfaces (13), (13) for a configuration that augments electrostatic induction. (Fig. 7)

Moreover, as a separate embodiment, convex curved surfaces (34) with gentle flow lines are formed on the upstream side of the outer cylindrical electrodes (22), and both flow line convex curved surfaces (34) and flow line convex curved surfaces (35) are positioned so they oppose one another, thereby intensifying the switching of the direction of flow and the change in the flow passageway cross section, extending the duration in which adsorption occurs due to stagnation, reverse flow, and turbulent flow of the dust-containing air (Fig. 8).

With regard to removal of dust clung onto the surfaces of the outer cylindrical electrodes, the power to electrode (22) is removed along with the retainer plate (25) by removing the connector board (31) and by pulling up and removing the head section retaining cylinder (28) and the housing (27), and after cleaning these, it is easy to restore them to their original state and join together. At this time, the retainer element (24) of the retainer plate (25) is separated from the limit switch

(17), thereby breaking off the flow of current between the high-voltage transformer (11) and the power source, so that there is no risk of electrocution.

As configured above, the present invention extends the duration of the cling effect on the outer cylindrical electrode by means of electrostatic induction of the dust-carrying air that passes between the electrodes, thereby increasing the efficiency of dust removal and reducing mold spores and yeast fungus.

Moreover, this is a particularly safe device since there is no danger that frictional force and resulting rectified electricity will be generated as a result of centrifugal force as the air passes through the unit, and the risk of malfunction due to sparking electric discharge between the adsorbed dust particles resulting in electrocution or explosion can be prevented, and the generation of ozone can be suppressed.

Also, given the device's simple and compact configuration, it can be manufactured less expensively, and it is also easy to move.

#### 4. Brief Description of the Drawings

Figure 1 is a front view. Figure 2 is a plan view. Figure 3 is a view of the bottom surface. Figure 4 is a cross-sectional view along the A-A line in Figure 1. Figure 5 is a cross-sectional view along the B-B line in Figure 1. Figure 6 is an enlarged view of the area indicated by the letter E in Figure 4. Figure 7 is an enlarged flow line cross section diagram of another embodiment. Figure 8 is an enlarged flow line cross section diagram of yet another embodiment.

Applicant: Kyowa Seiko, Ltd. Agent: Hiraki MIURA [seal]



5. 松田典似の日母

四章四十



#### 50 01G060

存許日本の製品

の世界を以えられた丹は中の人人にんを、刀 **する鬼疾而を盗扱をもろようにした空気をみ**生 気化かいて、上記ガリナる電流質を通過する気気 心具朴为风水及其古七。水口就称中城阳田大理长 ぎせるしとによって、私食のまで内でせまぶら空 もがおせ しんふよう にしゃとともものとナる文

本某の何等此。空女教女兼命突或长成 仁、史贞 ふんじんを呼ばれたよう気質をしめる音を反 ゃいて、その物質効果を付けるととのできる 都様を押し、とく比妥供で一段単純を発がから をす。 海平な土地ととう 佐い生変化を以て虫 有力。水口兴之族长代九、上身众似使月兴兴之 得名どとのできる兄女女皇守许女女を弁んとする 404886

我中央工程心理或代码5、专物公园代表化之5、

## **⑫ 日本国特新**万

# 公開特許公報

**(1)44:01:02** 51-90077:

63公開日 昭51 (1976) 8 6

四种瞬間 10-16080 **砂出顧日 昭か。(1975).2.6** 

安全請求

厅内整理番号 713 41

磁化本日砂 72 CFY

MALCI? BOJC 1/4P

とはいえず、大気行気による質点とその他のゴ ダスなぐんそく 北岩 糸 公 瀬 口 水 か で る る 烈民福祉心理与故秘宣和最短心。 于时、为《读书 もして北い放災筋攻上収益、大品、ゼスギの生で 京都长かいてさらだヹ。 非常領域の対抗政権だる いてサ及し、失奇上不写久の事或とそつ元。

**可凝凝体长加いて到走住。 滤泡器可采用い伤痕的** 成才名人のかとび祭祀成務衛により張淵徹底 せしかるもの文社衆党最も異い東京が民を属する 华化权的代价中化十二的股モの街上配价收留の点

かぐが合化とつで可去物質を取失せんとする点式 おそずれている。

。 及れる行わるにつうエラ明の利用を存しく出現・ サス。

京 ボー・日 ドゥット、 カロのドンタ 他のますして 東京 中心 はなる はなる はなまれる はなる はなまた うめん アック とう はの ちに しょ は ハッ

**398**—

₩D #351--50077 (2)

上包长女子。正常女件类母权研究の伊尔上纪念 知り食物による欠点を覚し敷養し、さらに安心水 · 仮れ、ふんじんら貝容益率を一せ可わるととの でもるのはもがはしたもので、ファンセートル、 高肥トランスを対象しその何に放成した円 女婦の ・女の何代点非した双星ャヤップ、ボルした北京 《在中心切得解状形目标专》5分K.天之名称此人。 タリングから書戻され、上万人日本と丹入される 在《四句太人七人士、《《诗传》《七九 不何也十 イツアの食品がを混乱する際、果の世界を与えら れ、無限可れた外質な難と返の側に制設すれた円 超过新国的数据旅行对外北。 《李蔚明 ておおすりでは中の本心らんであればを聞くれる せしめる最低を促するもので、 したべつておりの の母のだよう。対例する覚察は、教養の平行政器 との知の何は仏閣大政団権抗闘を共える行何と、 被用他无不利则之它。その行故の中国共富义政治 油気減ぐ、外質の質量質質気は皮質質質と発売を

グソノ穴河内の下方面の高松高に、井気を(o')を 化计元进程 医四七脑管 10 天外间只有四元代亡。七 の上万年にファンモートル似を内容した島は大針。 からでスタートルをチョンはものましょ アナンセ っちへ何(気知的だ仏教大トルナンの60大より メポススレい 1 を電点に無味するととかよび、な 电一大水平气力力创业获得部列代金属长标的 仁志 実施トラビス (13) 七月賞し、創象に保証収益 (24) 出典型 (25) 七七段份的长天正元素分元七点。0 可情可感 (34) 七月記トランネの玉の油形の泉して とし収集の外質文文製 (201)、(25) そ長収し大品 程.米 株大らなる内質やイファ(16)を収集して、放生さ ッス(io) ドリイストカイスァ (jの)を行列した金利 ロ英氏セイツア (頃)をおがし、 考売トランスの丸 **の食に口見大スととかるが、胃炎外炎の食のよ** 双非口口叫卖民(四) 长。水河明都形得其英量 (和)。 支持有限制 (DI) と主教物的尼戈夏和教行大会系の。 永貴成成 (四) 中部をして、十つ日間大声 (心) 予び 算成長 (24)の製品資品 (口) テキス成字の品が保証

(EI) 化内容电弧 (EL) 中央电弧 医 (EI) 上五下代数书 するように包収かめして、約372歳(24)と別用で せて見ぶし大上、その上が何日本に乗ぶえ fistic 具え、下側にすしフトスインナの押え替付 (A)モ かやする名は中町からなる神(上以 (25) を無がし、 数 紅荷記文量機の水ケダしたハウランク公司間の 上ガロロボル奥万田 (四) にっナチング (四) て仮の し、その上アは口質に同じ神え口(四)を従名し大 上、その上写命ロロに気の(to)を繋げるとのは 周朝 (20) 七百代 () 大竹林木材本乡市る郊和市 (33) を知事し、ボールト (DE) を含して好人歌(ed) と説 ・ 献 し、 甘思 自然をらしゅ、 ファンキートル何をか 号の歌。父女は延命章 (四) シミザガ土東 (20) の表 公取 (A) D I (C F (25) L B 。 P) 。 外间形成别无流 流 U、并其最 (ef 。内内公园で外国代或权于3名 なとする.

その頃、名近トランス (33) 《県界的には、入刀 電面入・0、100甲、組力電便 >・0、1平 K Y 、 平瀬 Y U W。 1 と は 駅と で 別 K 皮 切 た スイッテ に よ 声 点 収 す れ 以 か れ 不 弘 ス 中 の 本 ん じ ん

五 5 K 又、 別 0 死 施 引 と して、 於 2 5 K 又 (24) K で 上 近 代 化 か い て 成 か 正 凡 母 別 表 数 で (24) を 或 ひ い て 成 か 正 凡 母 別 日 長 知 で 成 か 日 国 区 区 下 代 戸 れ か い て 成 か な 反 説 か は 八 月 次 液 か む し て 対 内 さ せ 。 尽 か の ガ 内 の 次 た る 昭 昭 の 欠 化 む と う 也 化 ち せ 、 な 重 歴 気 む 伊 は 。 え か の 皮 化 と う 也 化 ち せ 、 な 重 歴 気 む 伊 は 。 と か て き る 。 ( 家 む 昭 )

東に、外有名種首に表面された本がじんの数要に出つては、対数品の数 (SI) を取り取し、対数件 上間 (SI)をよびハラグング (SI) を引上げて成り取した上い得点で (SI) とどくに人間を取 (SI) 生形を 伏を時間したほご 成状に立しておけてるできかど

との前、丹賀電塔 (Ju) K数サ大乗艦艦部 (20) b 医医乳蛋白肝 七水、外有医风,四) 化量分元的复形 M (BD)と日井眞貞 (21)とによって、豆女のお基ナ 医鼠窝口泻用或股椎立大大水白和口。 その円は点 成の母母母(実際的民政資格製の母庭製製 1324。 (20) 口口用权权 3 0 次、共同电压 (23) 电最联反应 (22) 上月前常瓶(14) の電視器 (131) 上の同様状態 2.4%。外兵で名(四)の四角共平(四)と四首軍者 C34) の是似英雄 (34) との四級をおまる先とすると と、日子の日本長官 (E) 依在汽气、G田美田 (IS) はくろうとするにとがはエレい。10次化によつ て促済水気無し、なれの対な収収を収め入するのが となり、とれだよのでか成状気の最充の存安、気 化汉以杜鹃哲院它就您它也外员写在何心智能教授 作用時間の延長が期ぐられ穴域が単七塊げしゆる 将京とナス。(お 4 日)

ひりて西瓜都県である。 との成材え近 (20) の ガえ 作者 (31) 水ヤミットスイッチ (31) と収益し、写匠 トフンパ (33) と変似との皮或せ原づので。成年の マイれを出じない。

生態の延明化、上記の保水だともので、資化成 質を通過する含成肥度水管電影器だよつで外貨電 配面に取製作用時間を延長するので、その取風が 水を集がよっその資本が四、低低品がの数をそれ するにと水できる。

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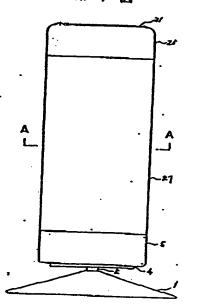
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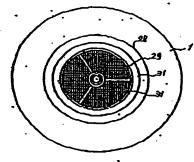
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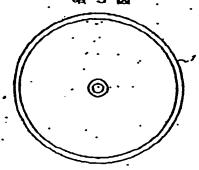
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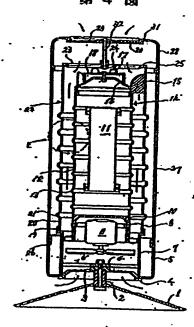


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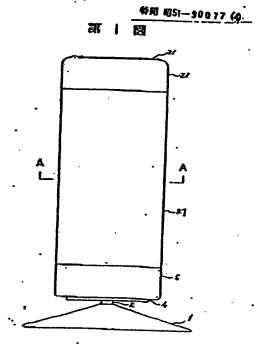
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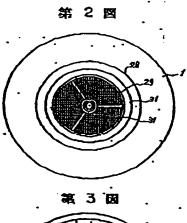


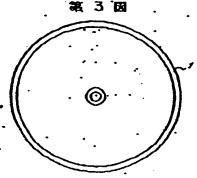


四京、『4日は33月A―A球ドかけら秋時間日、スコマは月日―3時代かける成成日四次、『4日日 は存む。 20日にかける成大が収収公司、エリ四次の(5) 完全例にかける月本大郎可配合司、本6日は5次。 に対の天命可にかける月女大郎百名の語でもる。 の日人 本品をは 集 44 本 エ

B 日人 本品を出 本 出 工 でき入 三 世 第 第 元







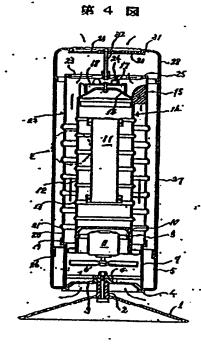
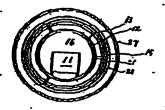
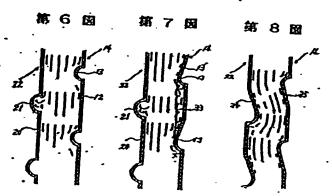


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**孝 5 図** 





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